REMARKS

1. Claims 1-95 are pending in the application. Claims 1-36 and 47-95 have been withdrawn by the Examiner from further consideration. Claims 90-95 have been canceled and new Claims 96-101 have been added. Support for new claims 96-97 and 99-100 is found at least in the specification at pp. 60-61, Table II. Support for new Claims 98 and 101 is found at least in the specification at p. 27, lines 13-17. Claims 42, 43, 44 and 46 have been amended. The Examiner is thanked for withdrawing previous rejections of Claims 37, 38 and 40. Claims 37-46 are rejected under 35 U.S.C. § 102(e) and under 35 U.S.C. § 103(a).

2. Claims 37, 38 and 40 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Pat. No. 6,775,453 to Verne Hornbeck et al. ("Hornbeck"). The rejection cites Hornbeck, Fig. 10 and text at col. 9, line 66 to col. 10, line 63, as anticipating Claim 37. Applicants traverse the rejections.

Claim 37

Hornbeck, in Fig, 10 and in the accompanying text, teaches a core 32 that has a single refractive index, namely "a higher index of refraction" than refractive layer 30 and an inner encircling layer 62. See col. 5, lines 55-57 and col. 10, lines 6-15. This latter passage teaches that the there are four levels of gradation in refractive index, including the core, the inner and outer layers, and the dielectric cladding material. As shown in Fig. 10 of Hornbeck, there are no gradual transitions, only the abrupt changes of layers, as shown in Fig. 10.

Claim 37, by contrast, claims a waveguide core having a refractive index that "gradually decreases from a maximum effective refractive index at the center of the core to a minimum effective refractive index at the outer border" in the direction of the y-coordinate (emphasis added). As explained in the specification, there may be many layers or gradations of materials, each varying slightly in refractive index from the layers adjacent to it. See, e.g., Table II on p. 60 of the specification, depicting many layers of a core material, the core having a refractive index that decreases gradually from a

maximum of 1.700 at the center to about 1.610 at the top and bottom layers. The steps in the index of refraction in Table II range from about 0.001 at the center to about 0.014 at the top and bottom surfaces of the core. Changes at the center are about 0.001 to 0.003, very gradually leading to steps of 0.005, 0.007, 0.008 and then out to a final step of 0.014 in the top and bottom layers of the core. The average step in refractive index is about 0.007 units, with an average of about 0.003 in steps nearest the center.

If gradual changes are not used, the light will be scattered and distorted rather than focused or defocused as desired. Hombeck does not anticipate Claim 37 at least because Hombeck does not teach or suggest a core with a refractive index that decreases gradually from a maximum at the center to a minimum at the outside border. Hornbeck teaches discontinuous or "step" layers with abrupt transitions, not gradual transitions. Accordingly, the rejection is overcome at least because Hombeck does not teach or suggest at least this limitation of Claim 37. Hombeck also does not teach or suggest an upper cladding as claimed. The Examiner is respectfully requested to withdraw the rejection.

Claims 38 and 40

Claim 38 is also rejected over Hombeck, the same passages as cited against Claim 37, the rejection stating that the refractive index is also graded in the x-coordinate, having a maximum refractive index at core 32 and "gradually decreasing outward." See Office Action, p. 2, line 26, to p. 3, line 2. As discussed above for Claim 37, Hombeck teaches a core 32 having a single refractive index. In terms of the x-direction, and as shown in Fig. 10, Hornbeck teaches inner and outer cladding layers. These are layers described only as having different refractive indices, and shown in Fig. 10 as having abrupt transitions.

By the same arguments above for Claim 37, Hornbeck does not teach or describe a core having a gradually decreasing refractive index, but shows only abrupt or "step" transitions in refractive index, whether in the x or y direction. Accordingly, the rejection of Claim 38 is overcome.

Claim 40 also recites a waveguide core with a refractive index that gradually decreases from a maximum effective refractive index at the center of the core to a

minimum effective refractive index at the outer borders. By the same arguments advanced for Claims 37 and 38, Claim 40 is allowable because Hornbeck teaches abrupt steps in refractive index, not a gradual change to avoid scattering and distortion of the light for which the waveguide is used.

Accordingly, the rejection does not make out a prima facie case of anticipation. Claims 37, 38, and 40 are allowable because the reference does not teach or describe all the limitations of the claims.

2. Claims 42, 44 and 46 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Pat. No. 6,339,667 to Young-Hui Song et al. ("Song"). The Office Action also rejects Claims 42, 44 and 46 as being unpatentable under § 103(a) in view of Song. Claims 42, 44 and 46 have been amended to overcome the rejections.

Support for the amendments to the claims is found at least in Claims 37, 40, and 41 as filed, and in the specification at pp. 60-61, Table II. The steps in value of the refractive index are deduced by subtracting a value in one row from a value in an adjacent row; the differences in refractive index range from 0.001 to 0.014. Further support for the amendment to Claim 46 may be found at least in the specification at p. and at p. 27, lines 13-17, and at p. 80, lines 12-18.

3. Claims 39, 41-43, and 45 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 6,775,453 to Verne Homebeck et al. ("Hornbeck"). The rejection cites Hornbeck, Fig. 10, and text at col. 9, line 66, through col. 10, line 63, per the rejections of Claims 37, 38 and 40. The rejection admits that Hornbeck does not teach the limitations of these claims, in which the refractive index varies in one direction and is constant in another direction. Office Action, p. 4, lines 10-14. The rejection states that it would have been an obvious matter of design choice to create such a waveguide based on the teachings of Hornbeck.

Applicants traverse the rejection. In order to make out a prima facie case of obviousness, the reference must teach or suggest all the limitations of the claim. The

rejection admits that Hornbeck does not teach the claimed limitations. There is no suggestion in Hornbeck to omit steps for making the optical waveguide with a refractive index that is constant in one direction with a gradually decreasing refractive index in a different direction. In addition, Hornbeck does not teach a gradual decrease in refractive index. Thus, the rejection fails to make out a prima facie case of obviousness against Claims 39, 41-43 and 45.

A refractive index that is constant

The distinction between a gradual decrease in one direction rather than two directions simultaneously is not merely a "design choice." It is clear from Applicants' specification, and from Hornbeck, that the semiconductor type of processing used to make optical waveguides is very time-and-step intensive. Waveguides made with layers having differences in refractive index in one direction are very different from the waveguides taught in Hornbeck. The "design choice" here is not simply the thickness of a layer or the refractive index of a particular step, but the entire principle of operation of the waveguide. Changing Hornbeck in this manner changes the operating principle of Hornbeck, that is, from propagation in two directions to propagations in more than one direction. If the proposed modification from the prior art would change the operating principle of the prior art, then the teachings of the prior art are not sufficient to render the claims prima facie obvious. M.P.E.P. 2143.01 at 2100-132. Claims 39, 41-43 and 45 are allowable at least because the reference does not teach or suggest this limitation.

A refractive index . . . that . . . gradually decreases

By the same arguments advanced for Claim 37, Hornbeck does not teach a core having a refractive index that gradually decreases from a maximum effective refractive index at the center of the core to a minimum effective refractive index at the outer borders. Hornbeck teaches only abrupt changes, not the gradual changes taught in the specification and claimed in Claims 37, 41, 43 and 45, and in Claims depending from them, including at least Claim 39. Accordingly, Claims 39, 41, 43 and 45 are allowable for the additional reason that Hornbeck does not teach this limitation of the claims.

The Examiner is respectfully requested to withdraw the rejection of Claims 39, 41-43, and 45 under 35 U.S.C. § 103(a) in view of Hornbeck. Claim 43, however, has been amended because of the amendment to Claim 42. Support for the amendment to Claim 43 is found at least in Claim 40 as filed, and in the specification at pp. 60-61, Table II.

4. Applicant submits that the references do not anticipate or render unpatentable the inventions of Claims 37-46. Applicant respectfully requests the Examiner to enter the amendment, to withdraw the rejections and to advance the claims to allowance. The Examiner is invited to contact the undersigned attorney for the Applicant via telephone if such communication would expedite this application or would be helpful to the Examiner.

Respectfully submitted,

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